

NOTES ON GEOGRAPHIC DISTRIBUTION

**Amphibia, Anura, Ceratophryidae, *Batrachyla leptopus* Bell, 1843:  
Insular distribution extension, Chile**

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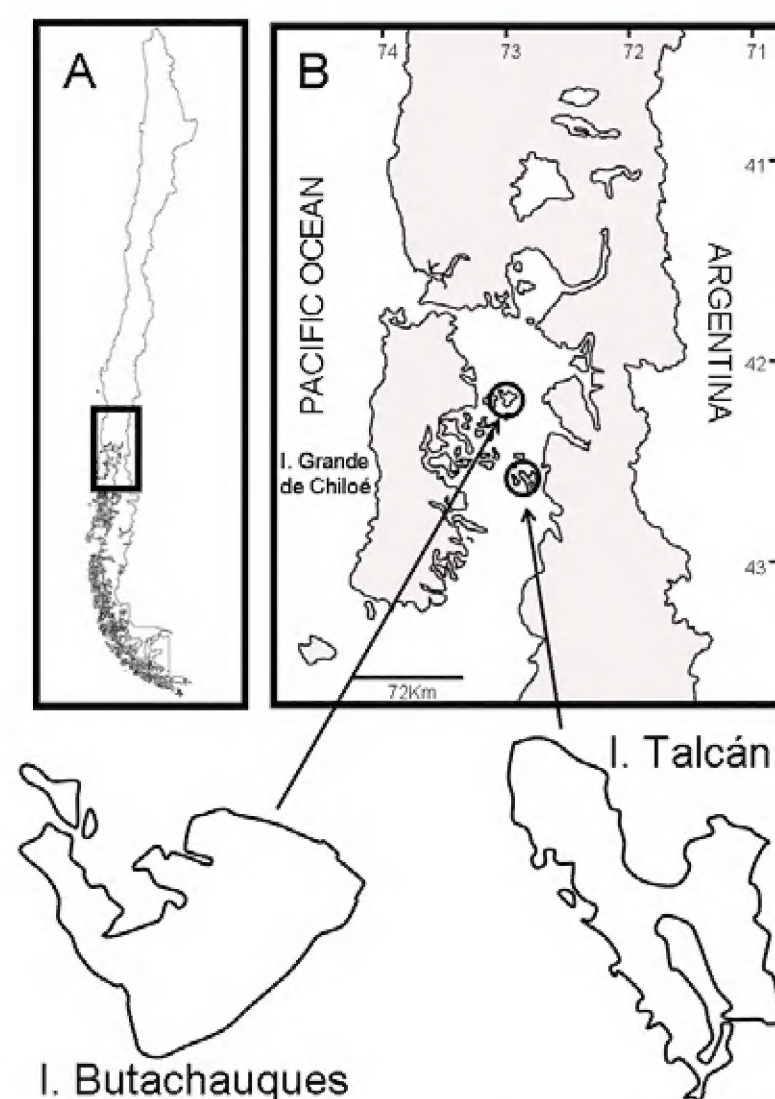
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The Archipelago of Chiloé in southern Chile includes Grande de Chiloé island and a series of small islands located on interior seas on the east, and by the Pacific Ocean on the west (Figure 1). The Andes mark the eastern limit of the interior seas, with deep glacial valleys and fjords mantled occasionally by glacial and volcanic deposits (Villagrán et al. 1986; Denton et al. 1999; Moreno and León 2003). Further, the Andes are a formidable climatic and biological boundary, harboring glaciers on the highest summits, some of which were active volcanoes during the Quaternary. The northeastern tip of Grande de Chiloé island is separated from mainland by the Chacao channel (*canal de Chacao*), a 25 km long seaway oriented along an east-to-west axis, having relatively shallow depths ( $\leq 80$  m) and narrow width ( $\simeq 2.5$  km).

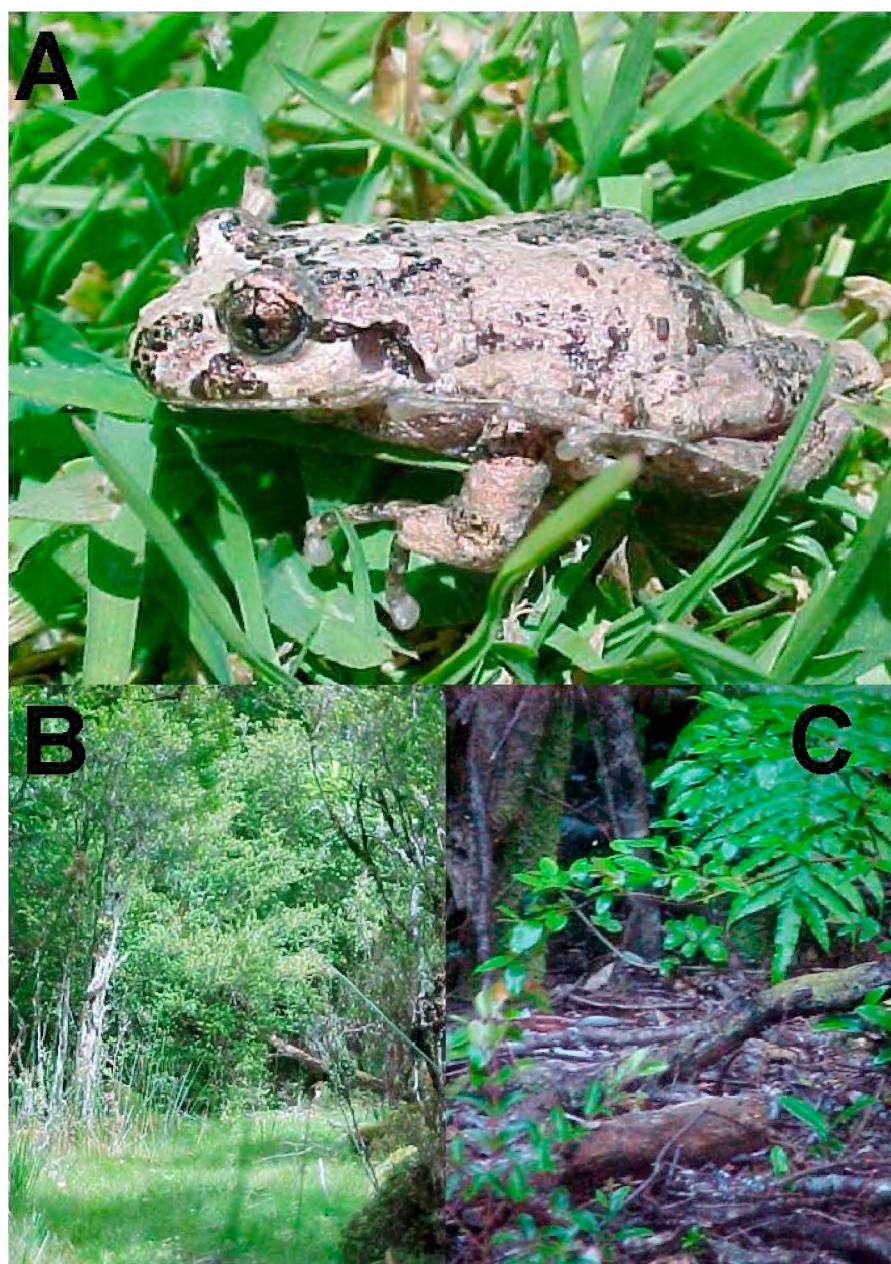
The Archipelago of Chiloé has many endemic species, especially of the genus *Batrachyla* Bell, 1843 (Ceratophryidae). Although they have been described as abundant in the area, there is scarce information about them. *Batrachyla leptopus* Bell, 1843 is a small-sized species (30-38 mm snout-vent length; Capurro 1960; Formas and Brieva 2000) distributed from Concepción (37° S) to the region of Aysén (ca. 45° S; Capurro 1960; Cei 1962; Úbeda et al. 2004). Information on its biology includes reports about its coloration, microhabitat use, diet, morphology, reproduction, and parental care of eggs (Cei 1962; Formas 1976; Úbeda and Núñez 2006). Formas and Brieva (2000) mentioned that the genetic distances between populations from Grande de Chiloé island and from the mainland suggest that the

formation of the Chacao channel has acted as a recent barrier to gene flow (contrary to what appears to have happened with *B. taeniata*, Brieva and Formas 2001, a species co-distributed with *B. leptopus*), indicating that there is low genetic variability between the populations on the island. *Batrachyla leptopus* has not been reported from the small islands of the Chilotan Archipelago. We report in this note the recent discovery of *B. leptopus* in two islands.



**Figure 1** A) Complete map of Chile, (B) area of the archipelago of Chiloé indicating the small island where the *Batrachyla leptopus* was newly recorded.





**Figure 2.** A) *Batrachyla leptopus* (not collected) from Talcán island from archipelago of Chilotan. Habitat of this species in (B) Talcán island, and (C) Butachauques island. Photographs by M. Vidal.

On 11-20 January 2005, we collected 15 individuals of *B. leptopus* (MZUC34526-28, MZUC34564-75) from Metahue, Butachauques island (42°18' S, 73°08' W), and seven individuals (MZUC31240-46) from Caleta Tendedor, Talcán island (42°44' S, 72°57' W), east of Grande de Chiloé island (Figs. 1 and 2). These specimens were collected together with two specimens of *Eupsophus* aff. *calcaratus*; one from Butachauques island (MZUC34576), and

another from Talcán island (MZUC34582). All specimens are deposited in the *Museo de Zoología* of *Universidad de Concepción*, Chile – MZUC.

During the culmination of the Last Glacial Maximum, global sea surface level stood ~ 120 meters below the modern coastline (Denton et al. 1999; Lambeck and Chappell 2001; Sidall et al. 2003), establishing a land bridge between Grande de Chiloé island and the mainland along the exposed continental shelf (Moreno et al. 1994). A possibility exists that local ice-free areas served as refugia or corridors for the biota (especially to *B. leptopus*) during the last glaciation (Heusser 1982; Villagrán et al. 1986; Formas 1989; Formas and Brieva 2000), allowing rapid expansion during deglaciation. For this reason, several amphibian species of the genus *Batrachyla*, *Eupsophus* and *Rhinoderma* are shared between islands and mainland (Ceí 1962). Given these constraints, it is possible that the modern insularity of the archipelago of Chilotan was achieved by ~ 7000 calendar years before present (cal yr BP) (assuming limited isostatic rebound and coastal erosion), and that biological interchange through land bridges was possible: (i) between Grande de Chiloé island and the mainland between 26,000 and 7000 cal yr BP, and (ii) between Grande de Chiloé island, mainland, and the archipelago 17,500 and 7000 cal yr BP, depending on the bathymetry of the interior sea. More recent dispersal events could have occurred via rafting to/from individual islands. However, it is important to consider that the sensitivity of the amphibians' skin suggests that the ability to withstand salinity by a possible sea transport is low. The present record provides an important contribution to the knowledge of *B. leptopus* geographic distribution and allows a better evaluation of the conservation status of this species.

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#### Literature cited

Brieva, L. M. and J. R. Formas. 2001. Allozyme variation and geographic differentiation in the Chilean leptodactylid frog *Batrachyla taeniata* (Girard, 1854). *Amphibia-Reptilia* 22: 413-420.  
Capurro, L. F. 1960. Nota sobre *Hylodes leptopus* Gunther (Anura, Leptodactylidae). *Investigaciones Zoológicas* 6: 5-7.

Ceí, J. M. 1962. *Batrachios de Chile*. Santiago: Ediciones Universidad de Chile. 128 p.  
Denton, G. H., C. J. Heusser, T. V. Lowell, P. I. Moreno, B. G. Andersen, L. E. Heusser, C. Schuchter, and D. R. Marchant. 1999. Interhemispheric linkage of paleoclimate during the last glaciation. *Geografiska Annaler* 81A: 107-153.



- Formas, R. 1976. Descriptions of *Batrachyla* (Amphibia, Anura, Leptodactylidae) tadpoles. *Journal of Herpetology* 10: 221-225.
- Formas, J. R. 1989. A new species of *Eupsophus* (Amphibia: Anura: Leptodactylidae) from southern Chile. *Proceedings of the Biological Society of Washington* 102: 568-576.
- Formas, J. R. and L. M. Brieva. 2000. Population genetics of the Chilean frog *Batrachyla leptopus* (Leptodactylidae). *Genetics and Molecular Biology* 23: 43-48.
- Heusser, C. J. 1982. Palynology of cushion bogs of the Cordillera Pelada, Province of Valdivia, Chile. *Quaternary Research* 22: 77-90.
- Lambeck, K. and J. Chappell. 2001. Sea level change through the last Glacial cycle. *Science* 292: 679-686.
- Moreno, P. I. and A. L. Leon. 2003. Abrupt vegetation changes during the last glacial to Holocene transition in mid-latitude South America. *Journal of Quaternary Science* 18: 787-800.
- Moreno, P. I., C. Villagrán, P. A. Marquet and L. G. Marshall. 1994. Quaternary paleobiogeography of northern and central Chile. *Revista Chilena de Historia Natural* 67: 487-502.
- Siddall, M., E. J. Rohling, A. Almogi-Labin, C. Hemleben, D. Meischner, I. Schmelzer and D. A. Smeed. 2003. Sea-level fluctuations during the last glacial cycle. *Nature* 423: 853-858.
- Úbeda, C. A. and J. J. Nuñez. 2006. New parental care behaviours in two telmatobiine genera from temperate Patagonian forests: *Batrachyla* and *Eupsophus* (Anura: Leptodactylidae). *Amphibia-Reptilia* 27: 441-444.
- Úbeda, C., R. Formas, H. Díaz-Paéz, E. Lavilla and N. Basso. 2004. *Batrachyla leptopus*. IUCN Red List of Threatened Species. Version 2009.1. Electronic database accessible at <http://www.iucnredlist.org>. Captured on June 2009.
- Villagrán, C., J. J. Armesto and R. Leiva. 1986. Recolonización postglacial de Chiloé insular: evidencias basadas en la distribución geográfica y los modos de dispersión de la flora. *Revista Chilena de Historia Natural* 59: 19-39.

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